Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
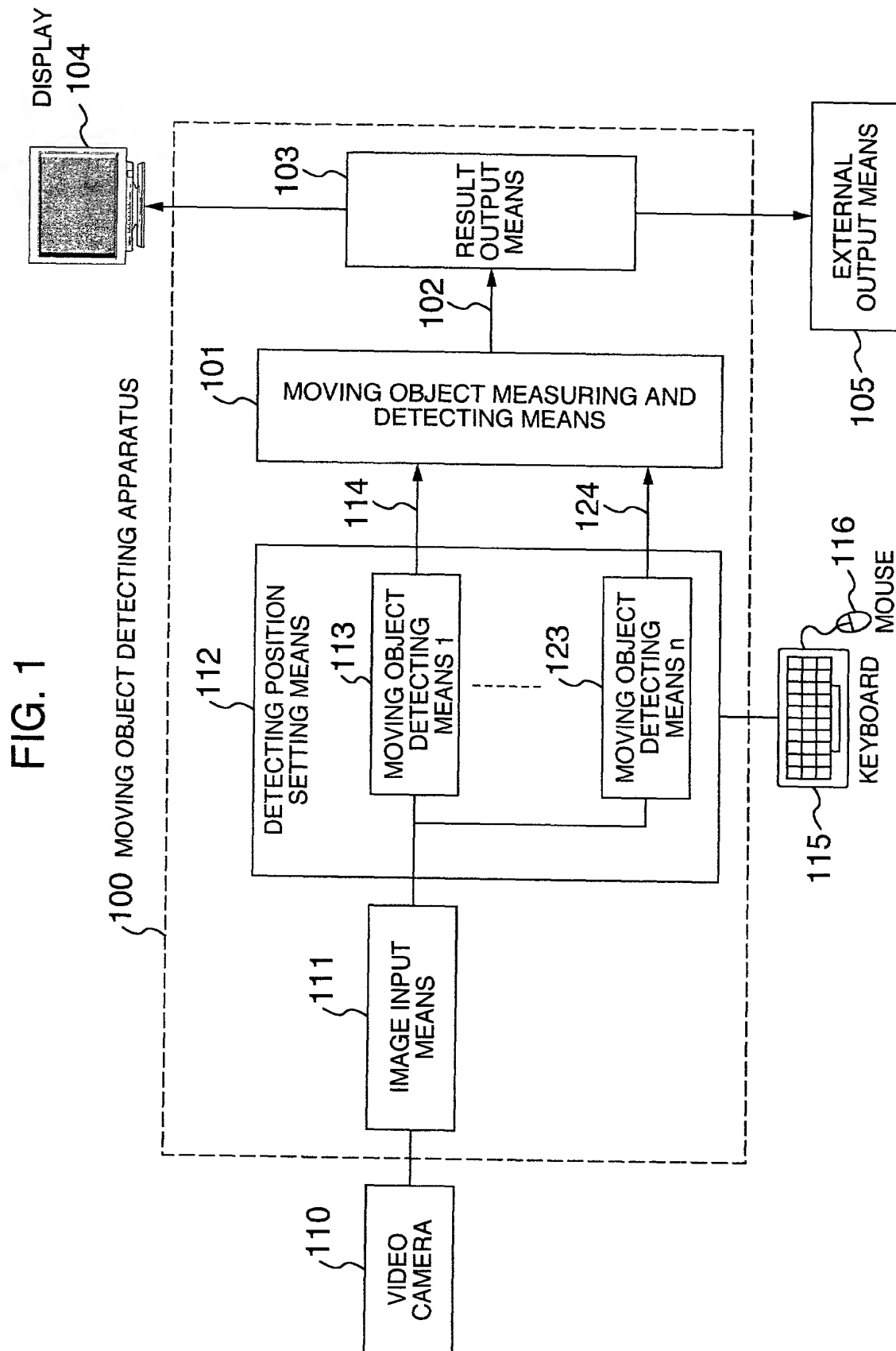
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FIG. 1

100 MOVING OBJECT DETECTING APPARATUS

DISPLAY 104

VIDEO CAMERA 110

IMAGE INPUT MEANS 111

DETECTING POSITION SETTING MEANS 112

MOVING OBJECT DETECTING MEANS 1   113

MOVING OBJECT DETECTING MEANS n   123

114

124

MOVING OBJECT MEASURING AND DETECTING MEANS   101

RESULT OUTPUT MEANS   103

102

EXTERNAL OUTPUT MEANS   105

KEYBOARD 115

MOUSE 116

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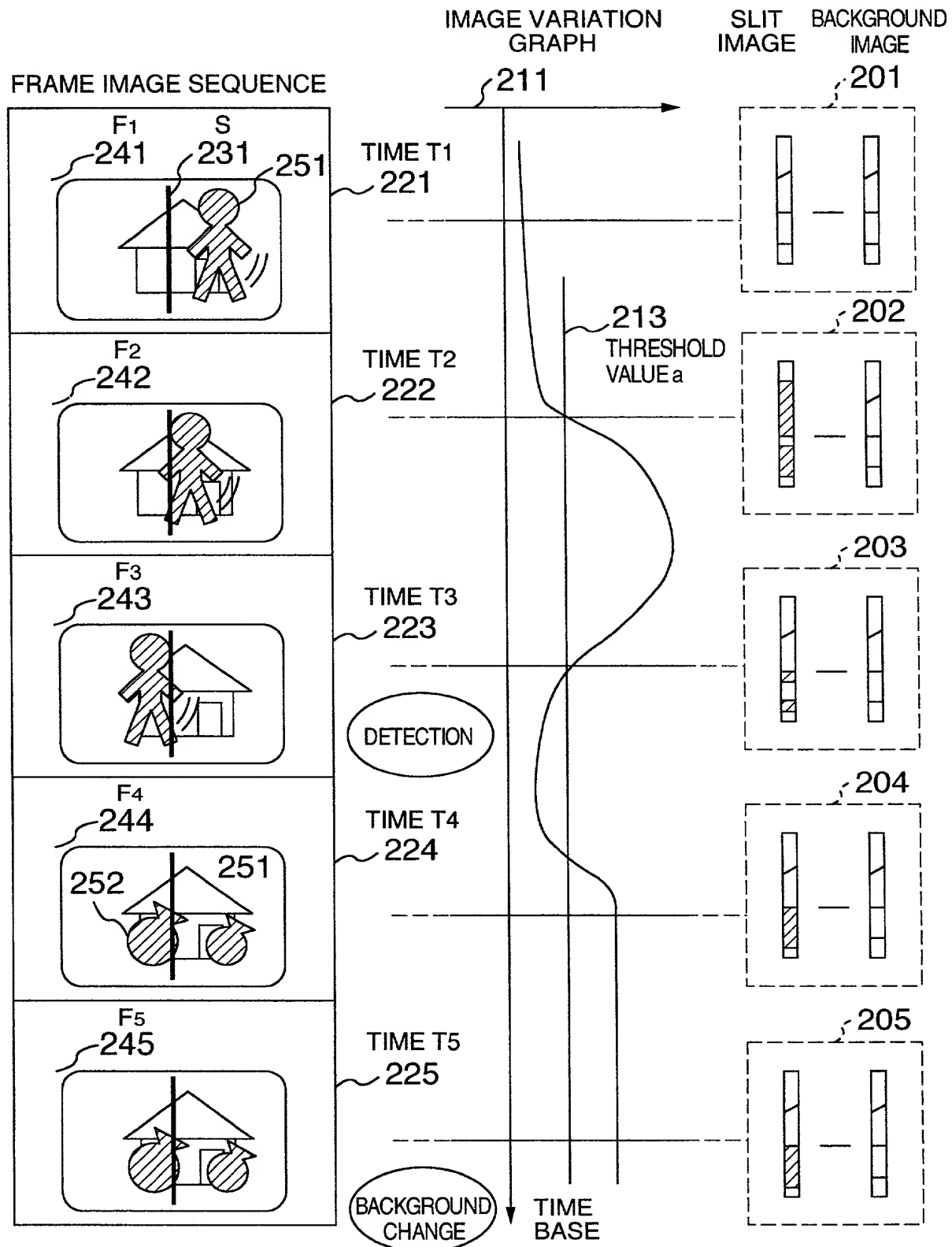**Atty Docket No.** 16869S-030500
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FIG. 2

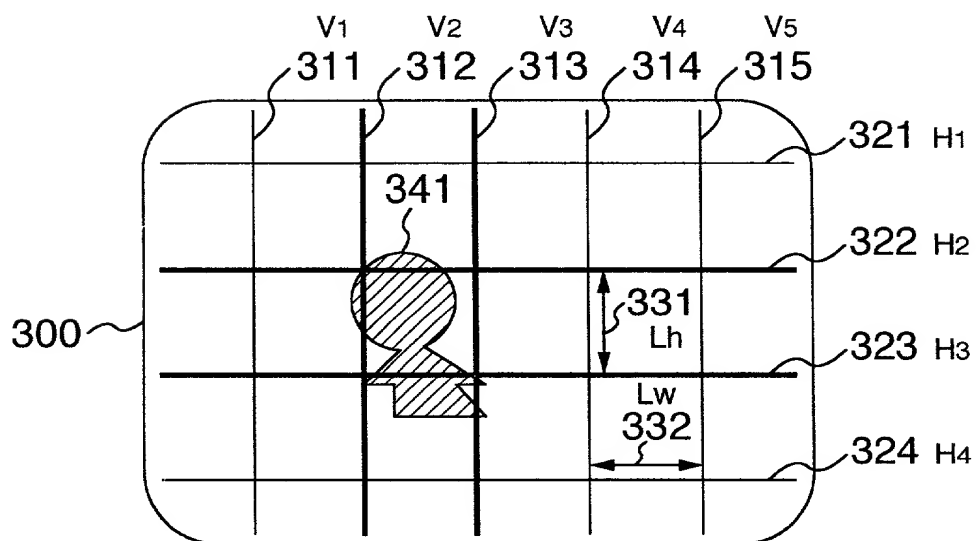*Robert C. Colwell, Reg. No. 27,431*   *(650) 326-2400*
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FIG. 3

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FIG. 4

IMAGE VARIATION GRAPH

SLIT IMAGE   BACKGROUND IMAGE

FRAME IMAGE SEQUENCE

F1 441   S 431

211

THRESHOLD VALUE a
413

401
421
IMAGE STRUCTURE VARIATION C1

F2 442

ENTRY ANTICIPATED

402
422
IMAGE STRUCTURE VARIATION C2

F3 443

403
423
IMAGE STRUCTURE VARIATION C3

MAX CHANGE

F4 444

404
424
IMAGE STRUCTURE VARIATION C4

DETECTION

F5 445

405
425
IMAGE STRUCTURE VARIATION C5

TIME BASE

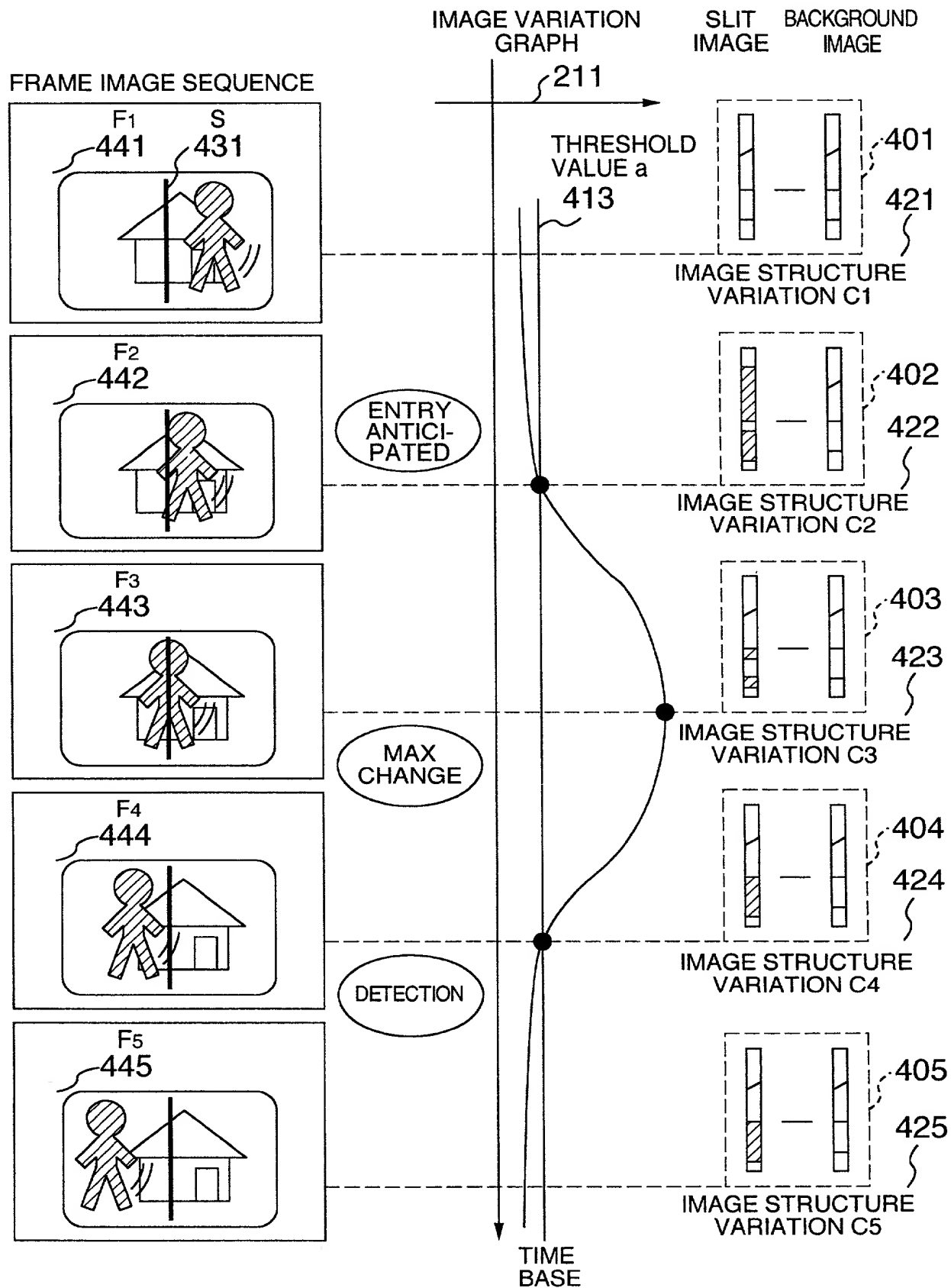Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
Applicant: Yoshinobu Hagawara, *et al.*
Title: Method of Detecting and Measuring a Moving Object and...
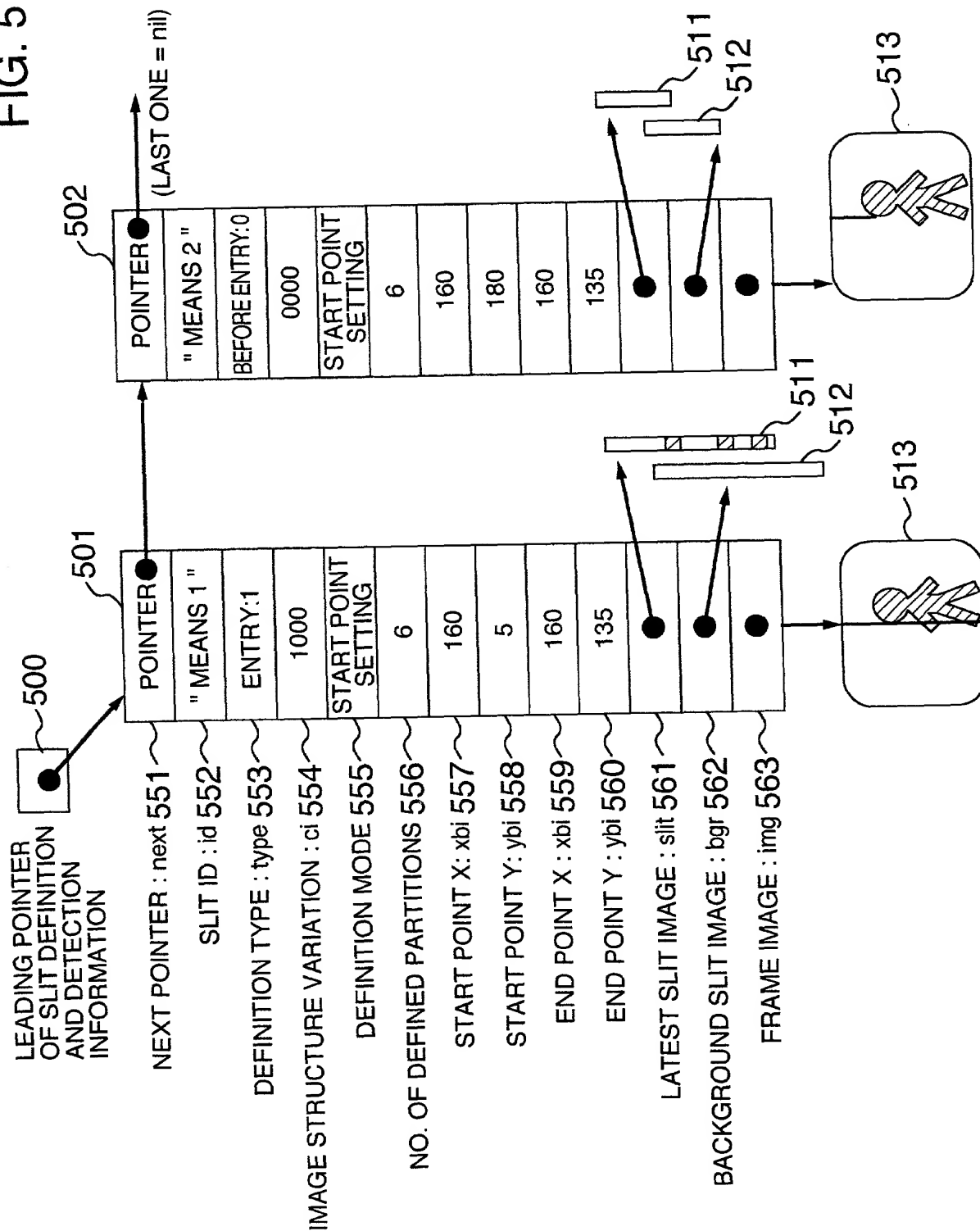**Atty Docket No.** 16869S-030500
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FIG. 5

LEADING POINTER
OF SLIT DEFINITION
AND DETECTION
INFORMATION ~500

	501		502
NEXT POINTER : next 551	POINTER ●		POINTER ● → (LAST ONE = nil)
SLIT ID : id 552	" MEANS 1 "		" MEANS 2 "
DEFINITION TYPE : type 553	ENTRY:1		BEFORE ENTRY:0
IMAGE STRUCTURE VARIATION : ci 554	1000		0000
DEFINITION MODE 555	START POINT SETTING		START POINT SETTING
NO. OF DEFINED PARTITIONS 556	6		6
START POINT X: xbi 557	160		160
START POINT Y: ybi 558	5		180
END POINT X : xbi 559	160		160
END POINT Y : ybi 560	135		135
LATEST SLIT IMAGE : slit 561	●		●
BACKGROUND SLIT IMAGE : bgr 562	●		●
FRAME IMAGE : img 563	●		●

511
512
513

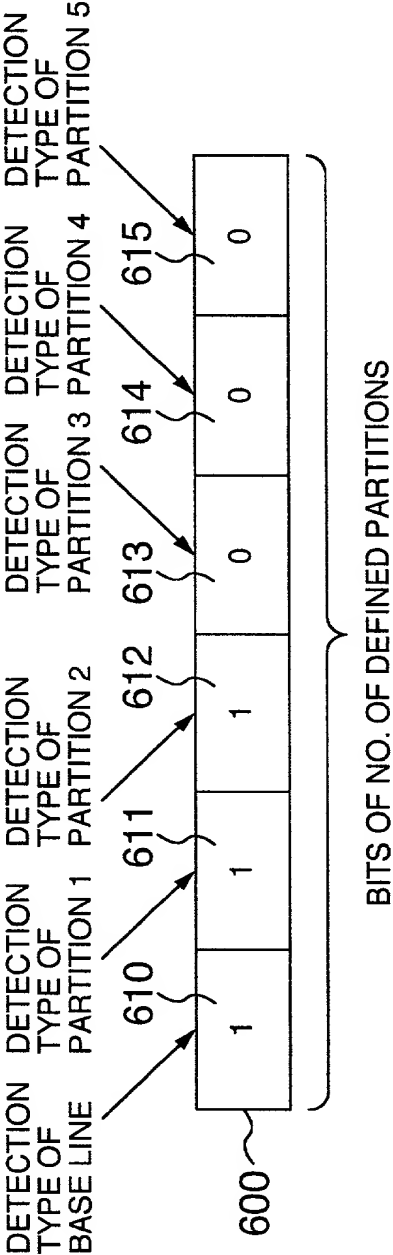*Robert C. Colwell, Reg. No. 27,431*   *(650) 326-2400*

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FIG. 6

DETECTION TYPE OF BASE LINE

DETECTION TYPE OF PARTITION 1 — 610

DETECTION TYPE OF PARTITION 2 — 611

— 612

DETECTION TYPE OF PARTITION 3 — 613

DETECTION TYPE OF PARTITION 4 — 614

DETECTION TYPE OF PARTITION 5 — 615

1	1	1	0	0	0

BITS OF NO. OF DEFINED PARTITIONS

600

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FIG. 7
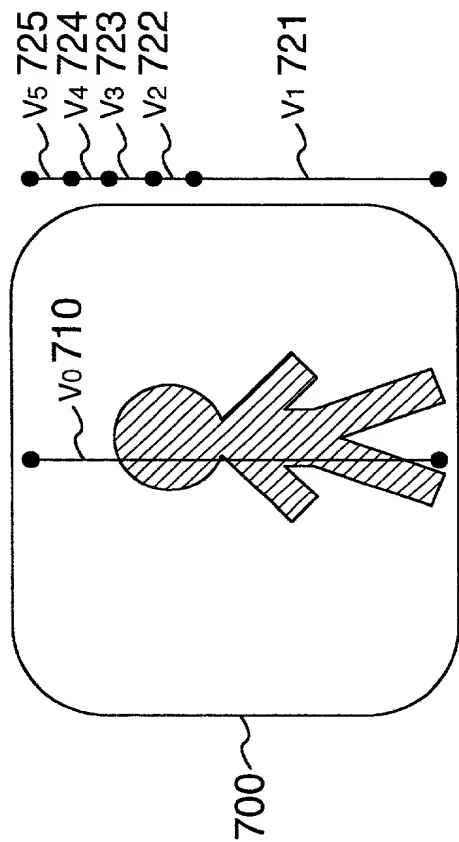
SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V0	0.0~2.0m	0	1	1	1	1	1
V1	0.0~1.6m	0	1	1	1	1	1
V2	1.6~1.7m	0	0	1	1	1	1
V3	1.7~1.8m	0	0	0	1	1	1
V4	1.8~1.9m	0	0	0	0	1	1
V5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY

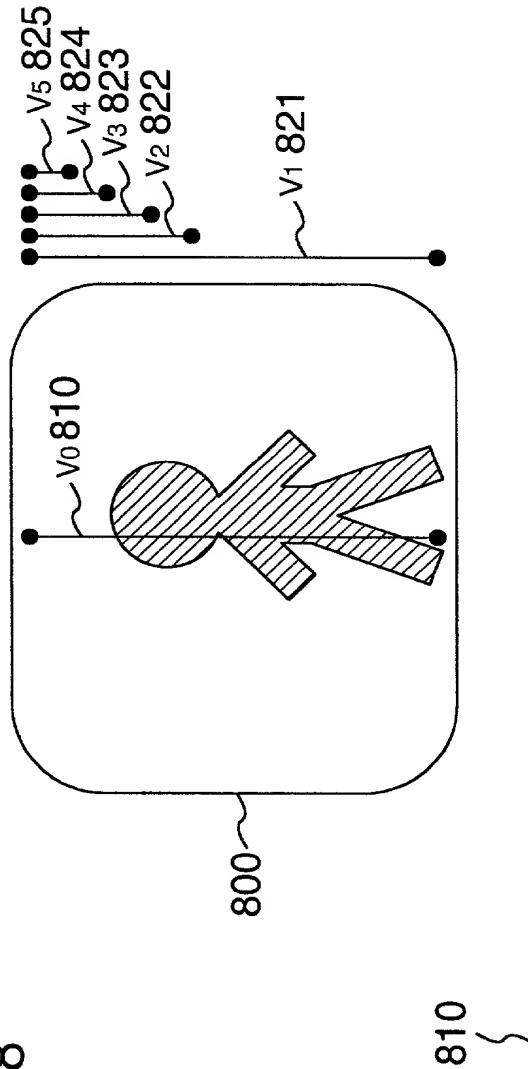Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
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FIG. 8

SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V_0	0.0~2.0m	0	1	1	1	1	1
V_1	0.0~2.0m	0	1	1	1	1	1
V_2	1.6~2.0m	0	0	1	1	1	1
V_3	1.7~2.0m	0	0	0	1	1	1
V_4	1.8~2.0m	0	0	0	0	1	1
V_5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY

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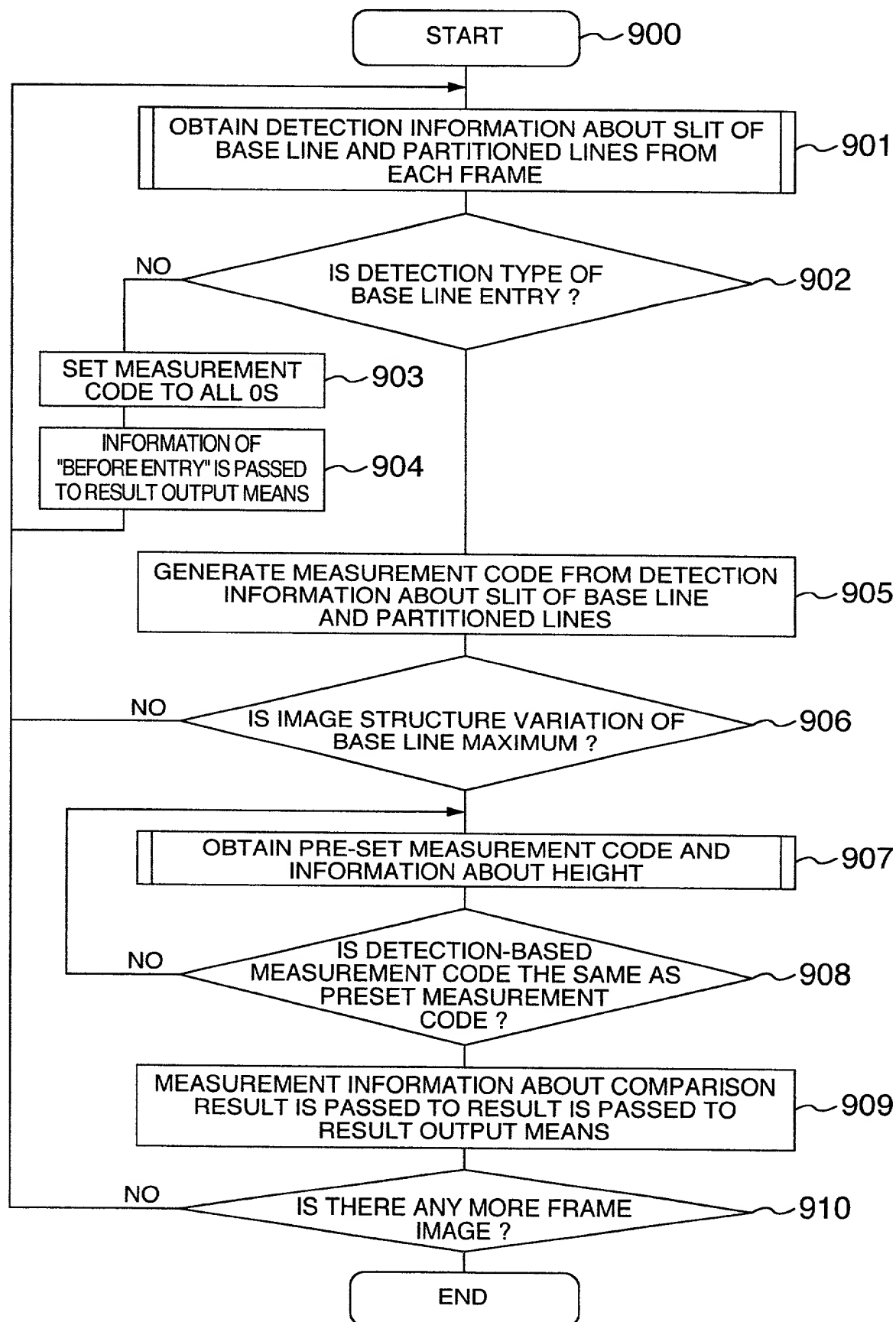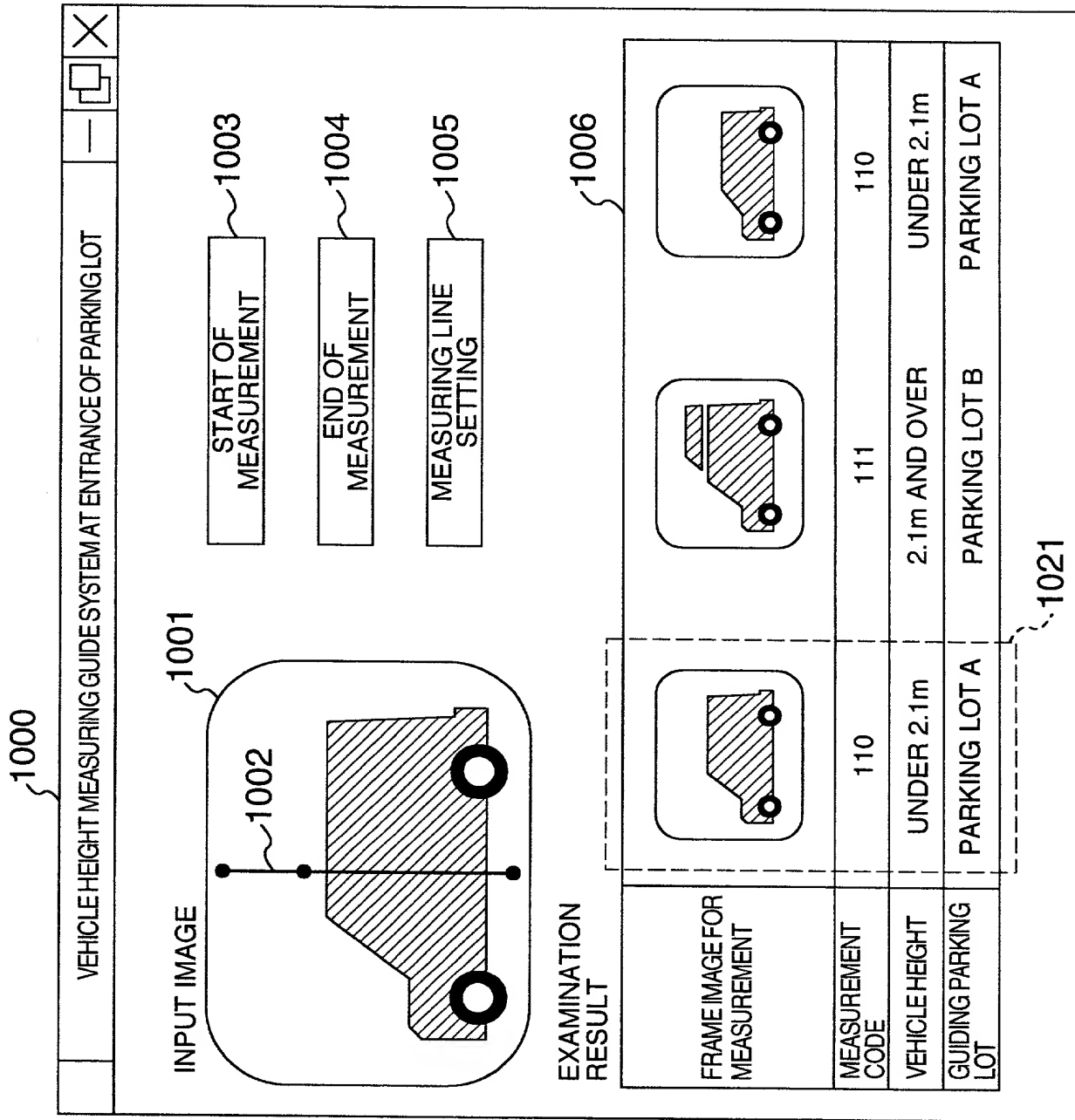**Atty Docket No.** 16869S-030500
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FIG. 9

START 〜900

OBTAIN DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES FROM EACH FRAME 〜901

IS DETECTION TYPE OF BASE LINE ENTRY ? 〜902

NO

SET MEASUREMENT CODE TO ALL 0S 〜903

INFORMATION OF "BEFORE ENTRY" IS PASSED TO RESULT OUTPUT MEANS 〜904

GENERATE MEASUREMENT CODE FROM DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES 〜905

NO IS IMAGE STRUCTURE VARIATION OF BASE LINE MAXIMUM ? 〜906

OBTAIN PRE-SET MEASUREMENT CODE AND INFORMATION ABOUT HEIGHT 〜907

NO IS DETECTION-BASED MEASUREMENT CODE THE SAME AS PRESET MEASUREMENT CODE ? 〜908

MEASUREMENT INFORMATION ABOUT COMPARISON RESULT IS PASSED TO RESULT IS PASSED TO RESULT OUTPUT MEANS 〜909

NO IS THERE ANY MORE FRAME IMAGE ? 〜910

END

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FIG. 10

1000

VEHICLE HEIGHT MEASURING GUIDE SYSTEM AT ENTRANCE OF PARKING LOT

INPUT IMAGE   1001

1002

START OF MEASUREMENT   1003

END OF MEASUREMENT   1004

MEASURING LINE SETTING   1005

1006

EXAMINATION RESULT

FRAME IMAGE FOR MEASUREMENT		
MEASUREMENT CODE	110	111	110
VEHICLE HEIGHT	UNDER 2.1m	2.1m AND OVER	UNDER 2.1m
GUIDING PARKING LOT	PARKING LOT A	PARKING LOT B	PARKING LOT A

1021

FIG. 11

1100

MEASURING LINE DEFINITION

DEFINITION MODE: 1106

● PARTING POINT SETTING

○ START POINT SETTING

DEFINITION IMAGE 1104 1101

1105

1102

1103

BASE LINE-0 SLIT POSITION SETTING: 1107

| START xb0 | 160 | START yb0 | 005 |
| END xe0 | 160 | END ye0 | 235 |

BASE LINE-1 SLIT POSITION SETTING: 1108

| START xb1 | 160 | START yb1 | 005 |
| END xe1 | 160 | END ye1 | 210 |

BASE LINE-2 SLIT POSITION SETTING: 1109

| START xb2 | 160 | START yb2 | 210 |
| END xe2 | 160 | END ye2 | 235 |

DEFINING CONDITIONS: 1110

MEASURE-MENT CODE	VEHICLE HEIGHT		DESIGNATED PARKING LOT
110	:	UNDER 2.1m →	PARKING LOT A
111	:	2.1m AND OVER →	PARKING LOT B

OK 1111

CANCEL 1112

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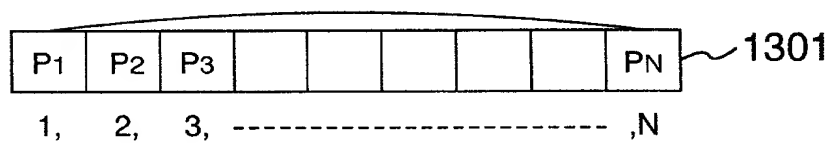Atty Docket No. 16869S-030500
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FIG. 12

MEASURING LINE DEFINITION — 1200

DEFINITION IMAGE — 1204

DEFINITION MODE: — 1206
○ PARTING POINT SETTING
◉ START POINT SETTING

BASE LINE-0 SLIT POSITION SETTING: — 1207
START xb0 160   START yb0 005
END xe0 160   END ye0 235

BASE LINE-1 SLIT POSITION SETTING: — 1208
START xb1 160   START yb1 005
END xe1 160   END ye1 235

BASE LINE-2 SLIT POSITION SETTING: — 1209
START xb2 160   START yb2 210
END xe2 160   END ye2 235

DEFINING CONDITIONS: — 1210

MEASURE-MENT CODE		VEHICLE HEIGHT		DESIGNATED PARKING LOT
110	:	UNDER 2.1m	→	PARKING LOT A
111	:	2.1m AND OVER	→	PARKING LOT B

OK — 1211

CANCEL — 1212

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FIG. 13A
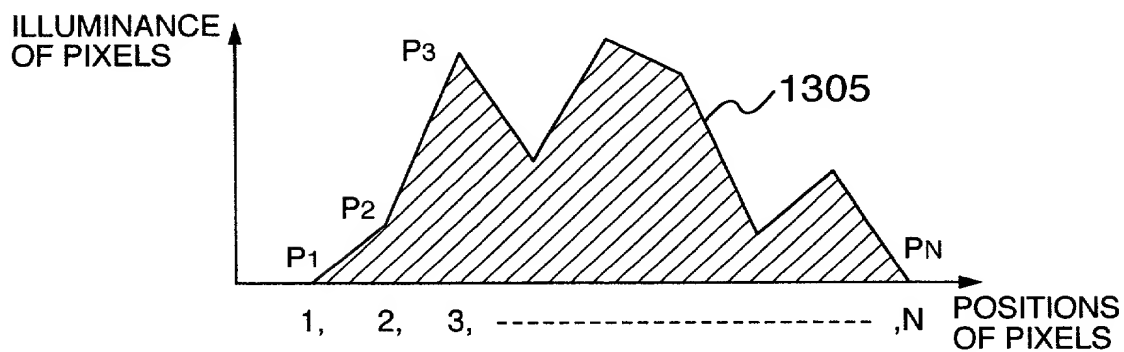## SLIT

P1 ---- PN :
ILLUMINATION OF EACH IMAGE

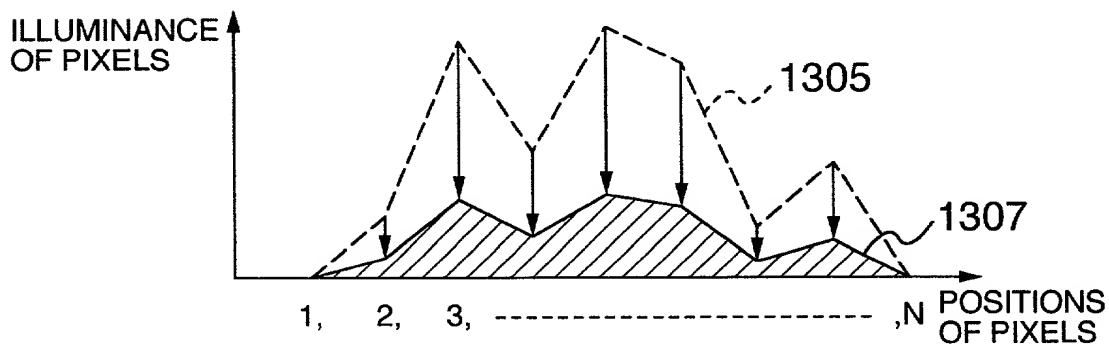| P1 | P2 | P3 | | | | | | PN |

~ 1301

1, 2, 3, ------------------------- ,N

FIG. 13B
BACKGROUND SLIT

ILLUMINANCE
OF PIXELS

P3

1305

P2

P1

PN

1,   2,   3, ----------------------- ,N   POSITIONS
OF PIXELS

FIG. 13C

CHANGES IN SLIT PROFILE WHEN THE IMAGE IS
DARKENED BY SHADOW OR THE LIKE

ILLUMINANCE
OF PIXELS

1305

1307

1,   2,   3, ----------------------- ,N   POSITIONS
OF PIXELS

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FIG. 14A   SLIT IMAGE EXPRESSED BY VECTOR NOTATION

$$V = (P_1, P_2, P_3 \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots , P_N)$$

1401

FIG. 14B   SLIT IN VECTOR SPACE

b3   b4

b2

P3

V ~ 1401

P2

P1

b1 ··· bn : BASE VECTORS

b1   PN

bn
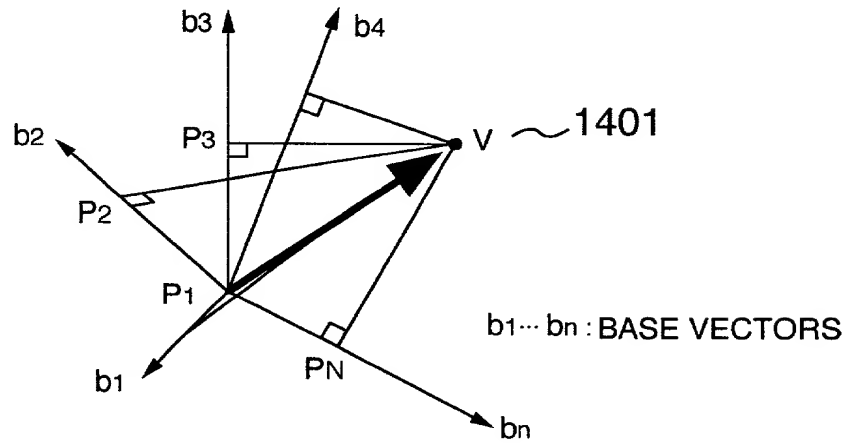
FIG. 14C   CHANGES IN SLIT VECTORS WHEN THE IMAGE IS DARKENED BY SHADOW OR LIKE

b3   b4

b2

V ~ 1401

V' ~ 1403

FORMED AS A RESULT OF A CHANGE IN ILLUMINANCE IN V

b1

bn

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FIG. 15